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A BALLOON-MAKING FLY.

J. M. ALDRICH AND L. A. TURLEY.

ON June 16 of this year, while passing along a country road near Moscow, Idaho, our attention was attracted by some bright white objects moving to and fro in the air at an elevation of eight or ten feet. A second look seemed to indicate that these objects were connected with small insects. On capturing the insects they were found to be males of a species of *Empis*, each carrying between its hind feet a peculiar structure which is referred to in the title as a balloon. This is of elliptical shape, about 7 mm. long (nearly twice as long as the fly), hollow, and composed entirely of a single layer of minute bubbles, nearly uniform in size, arranged in regular circles concentric with the axis of the structure. The beautiful, glistening whiteness of the object when the sun shines upon it makes it very conspicuous. The bubbles were slightly viscid, and in nearly every case there was a small fly pressed into the front end of the balloon, apparently as food for the *Empis*, as the attached species were partly *Chironomus* and partly *Oscinids*, and other *Acalyprate Muscids*. In all cases they were dead.

The balloon appears to be made while the insect is flying in the air. Those flying highest had the smallest balloons. The bubbles are probably produced by some modification of the anal organs, as in *Aphrophora* and other leaf-hoppers, but no positive observations on this point could be made. It is possible that the captured fly serves as a nucleus to begin the balloon on. One case of a captured fly but no balloon was observed. After commencing, it is probable that the rest of the structure is made by revolving the completed part between the hind legs and adding more bubbles somewhat spirally. The posterior end of the balloon is left more or less open.

The balloons were so light and sticky that they could not be preserved with any success. The first lot obtained were placed

in a corked vial, and had all collapsed by the next day. The second lot were placed in an open vial, which was left on the ground for a little while, and the ants carried off all the specimens. A third lot in open vials retained their shape in some degree, but were all more or less shriveled. One placed in alcohol immediately dissolved.

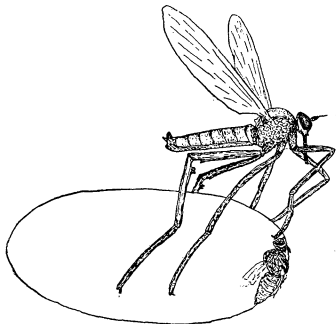


FIG. 1.

The purpose of this structure is to attract the female. When numerous males were flying up and down the road, it happened several times that a female was seen to approach them from some choke-cherry blossoms near by. The males immediately gathered in her path, and she with little hesitation selected for a mate the one with the largest balloon, taking a position *upon his back*. After copulation had begun, the pair would settle down towards the ground, select a quiet spot, and the female would alight by placing her front legs across a horizontal grass blade, her head resting against the blade so as to brace the body in position. Here she would continue to hold the male beneath her for a little time, until the process was finished. The male, meanwhile, would be rolling the balloon about in a variety of positions, juggling with it, one might almost say. After the male and female parted company, the male immediately dropped the balloon upon the ground, and it was greedily seized by ants.

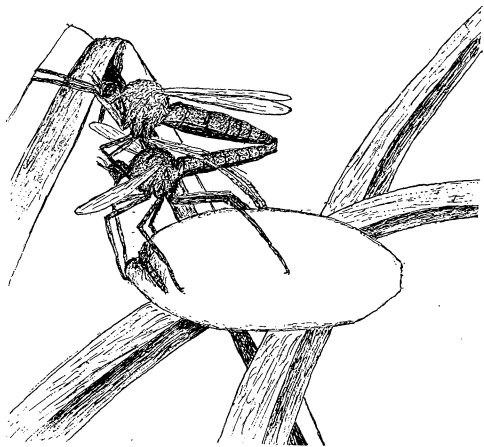


FIG. 2.

Of the accompanying sketches, Fig. 1 shows the position of

the balloon when the male is flying. It is frequently carried farther back, apparently by the hind legs alone. Fig. 2 shows the position assumed in copulation, the male underneath rolling the balloon.

No illustration could properly show the beauty of the balloon, still less could anything worthy of the subject be made from the shriveled and flattened specimens that now remain in our

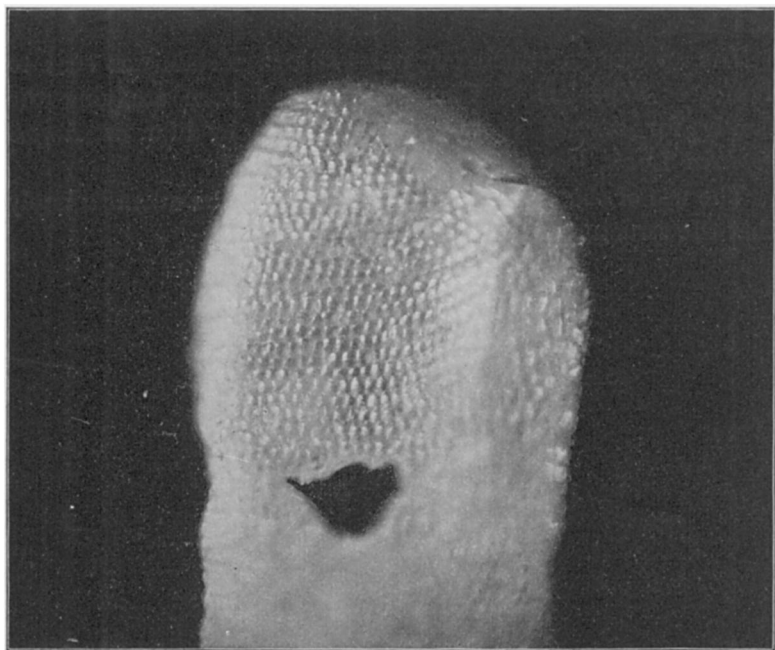


FIG 3.

possession. The half-tone (Fig. 3) serves only to show the way it is formed of bubbles.

The only published observations at all comparable with these are on the European species of *Hilara*, a genus of Empidæ closely related to *Empis*, and especially on *Hilara sartor* Becker. Several entomologists have published articles on the species, and there has been considerable difference of opinion as to the nature and purpose of the structure carried by the fly, as well as the method of carrying it. Professor Mik, in the

Wiener Entomologische Zeitung, Vol. XIII, pp. 271-284, and Pl. II, Figs. 8-13, gives an exhaustive discussion of the whole subject, with citations of the other authors and extracts from their papers. According to Mik, who had abundant opportunities for observation, the male produces a real web which is borne by the hind feet and serves to assist the fly in the somewhat peculiar gyrations of its flight. The different nature of the structure makes it unnecessary to go into further particulars here.

The species to which our observations pertain was sent to Professor Wheeler, of Chicago, who has been studying the family for several years, and identified by him as *Empis poplitea* Loew, "or a closely related species."

The use of the term "balloon" should not be taken to imply that the structure described is lighter than air.